The IceCube Project at LBNL

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IceCube is a discovery instrument that will explore new territory – the high energy neutrino sky in the TeV to PeV range. IceCube will be the first kilometer-scale neutrino telescope. Its purpose is to detect high energy neutrinos that may be generated at Active Galactic Nuclei, Gamma-Ray Bursters, Supernova Remnants, and possibly other high energy-density sites in the cosmos. Searches for supersymmetric particles and other exotica will also be carried out. It will be sensitive to all three neutrino flavors.

IceCube will consist of 80 strings located 125 m apart, each having 60 phototubes positioned at depths from 1400 to 2400 m below the surface of the Antarctic ice sheet at the South Pole. The enclosed volume will be one cubic kilometer. There will be an associated air-shower array, IceTop, consisting of two ice Cerenkov tanks positioned on the surface at the top of each IceCube string. IceTop will aid in the calibration of IceCube and, when operated in coincidence, be able to study the composition of the cosmic ray flux.

The construction schedule for IceCube begins with the deployment of four strings in January, 2005 and then (approximately) 12, 16, 18, 18 and 12 strings during successive Antarctic summers. The detector will become operational for physics after the first 16 strings are deployed, and can be operated in association with the 19 strings of AMANDA-II.

LBNL is responsible for the Data Acquisition System including both hardware and software. In addition, we are designing the overall system software architecture and the software for experiment control. Because the detector can be "operated" after the deployment of the first season's strings, the schedule for the DAQ and associated deliverables is heavily front-loaded. The Digital Optical Module or DOM is the system of phototube, digitizing electronics, and calibration devices - all contained in a 13" diameter glass pressure sphere (Fig. 1). From a total of 5000 main boards (Fig. 2) for the DOMs, an initial 400 must be produced and tested by August, 2004.

The firmware and software that enable the full functionality of the DOMs must be ready in time for the January 2005 deployment. The system is being designed with long-term reliability in mind, as the DOMs, once deployed, are forever inaccessible. An important feature is that all of the DOM's software and firmware (with the exception of a minimal boot code) can be downloaded from the surface after deployment. This enables future improvements and upgrades.

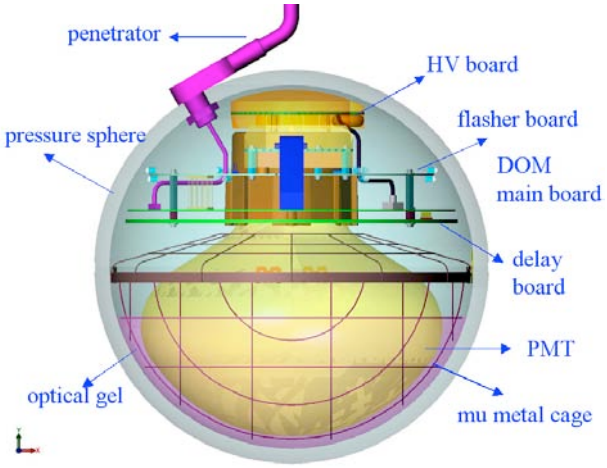

FIG. 1 The Digital Optical Module

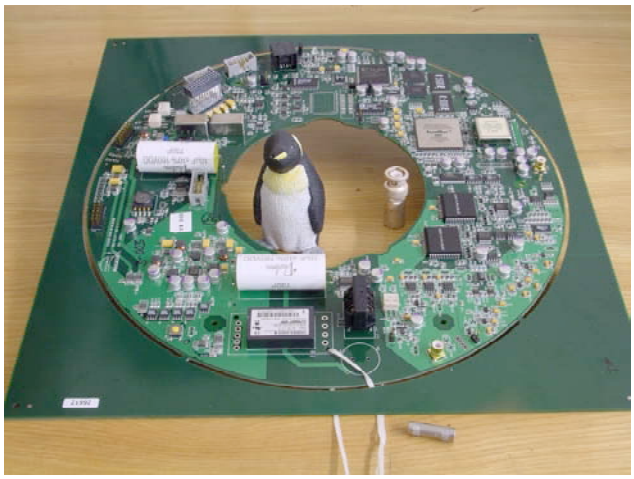

FIG. 2: The main electronics board for the Digital Optical Model.

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